

### **REMARKS**

By the present amendment, claims 8-9 and 14 -20 are pending in the application.

#### **Claim Amendments**

Independent claims 8, 14 and 16 have been amended to specify --maintaining a space at least at the region corresponding to the extended direction of the web of the split tee.--

This amendment is supported, e.g., in Fig. 12(b) of the drawings which discloses space keeping members 24 maintain a space in the extended direction of the web 6 of the split tee 4.

Independent claims 18, 19 and 20 have been amended to specify that --the thickness of the flange is partially reduced at least at the region corresponding to the extended direction of the web of the split tee.--

This amendment is supported, e.g., in Figs. 13(a) and 13(b) which disclose that the thickness of the flange 5 of the split tee 4 is partially reduced in the extended direction of the web 6 of split tee 4.

#### **Double Patenting**

Claims 8 to 20 (should be claims 8-9 and 14-20 as claims 10-13 were previously canceled) were rejected for obviousness-type double patenting over claims 1-6 of U.S. Patent No. 6,739,099 in view of U.S. Patent No. 4,905,436 to Matsuo et al.

In response to the obviousness-type double patenting rejection, enclosed is a Terminal Disclaimer with respect to U.S. Patent No. 6,739,099. The Terminal Disclaimer

contains deposit account authorization to charge the fee associated with the filing of a Terminal Disclaimer.

In view of the Terminal Disclaimer, it is respectfully requested that the obviousness-type double patenting rejection of claims 8-9 and 14-20 be withdrawn.

### **§103**

Claims 8-20 (should be claims 8-9 and 14-20 as claims 10-13 were previously canceled) were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,059,482 to Beauvoir in view of U.S. Patent No. 4,905,436 to Matsuo et al.

This rejection, as applied to the amended claims, is respectfully traversed.

### **Present Invention**

The present invention provides a column-and-beam join structure capable of plasticizing a split tee in advance of a steel beam or a steel column by using a split tee which can secure energy absorption by providing an energy absorbing function to the flange of the split tee, which is connected to the steel column by using bolts, so that the energy caused by earthquake, strong wind and the like can be effectively absorbed by the flange of the split tee, thus avoiding damage to the column and the beam.

According to the present invention, when a large external force acts on the structure, the flange of the split tee is plasticized and deformed at a space provided by the space keeping members or by a partially reduced thickness of the flange of the split tee prior to other parts thereof and the column and the beam.

Since the plasticization and/or deformation of the flange of the split tee absorbs the energy of an external force, deformation is limited to the flange of the split tee and the flange of the column is not damaged.

As the result, the structure can be reconstructed by only replacing the plasticized split tees without replacing the column.

In order to plasticize the flange of the split tee prior to other part thereof and the column and the beam, it is important to provide a space for the flange of the split tee to deform between the flange of column and the flange of the split tee at least at the region corresponding to the extended direction of the web of the split tee.

According to the present invention, in order to provide this space, (i) space keeping members are provided between the flange of column and the flange of the split tee, or (ii) a partially reduced thickness portion is provided to the flange split tee at least at the region corresponding to the extended direction of the web of the split tee.

i) As shown in Fig. 12(a), the space keeping members are inserted between the flange of the column and the flange of the split tee.

The flange of the split tee and the steel column are connected in the state of maintaining the space at least at the region corresponding to the extended direction of the web of the split tee (Claims 8, 14 and 16).

(ii) The space may be provided by partially reducing the thickness of the flange of the split tee.

As shown in Fig. 13(a) and Fig. 13(b), a partially reduced thickness of the flange is provided at least at the region corresponding to the extended direction of the web of the split tee (Claims 18, 19 and 20).

Further, in a case where the space keeping members are provided as explained in (i) above, in order to make the plasticization of the flange of the split tee further effective, it is also possible to combine a split tee having a partially reduced cross sectional area of the

flange as shown in Figs. 13(a), 13(b), 14(a), 14(b) and 15(a) to 15(c) with the space keeping members (Claims 9, 15 and 17).

Note that, in this case, the portion where the partially reduced cross sectional area of the flange of the split tee is provided is not necessarily limited to the region corresponding to the extended direction of the web of the split tee as shown in the above Figures.

### **Patentability**

U.S. Patent No. 6,059,482 ("US '482") relates to a bolted connector (split tee) for connecting beams to columns.

The connector of US '482 has a web having a partially reduced portion (thickness) and a flange having a tapered flange.

However, this connector is made by die cast with a block of flange and has materially poor deformability.

Therefore, US '482 does not disclose or suggest the technical feature of the present invention where the flange of the split tee is plasticized prior to other parts thereof and the column and beam.

Though the cross-sectional area of the flange of US '482 is reduced, the flange is merely tapered and it does not have a reduced thickness promoting plasticization such as in the present invention.

According to the present invention, in order to plasticize the flange of the split tee prior to other parts thereof against the tensile or compressive stress exerted through the web, the cross-sectional area of the flange of the split tee, in this case the thickness of the flange, is partially reduced at least at the region corresponding to the extended direction of the web of the split tee.

Since, the shape and portion where the partially reduced cross-sectional area portion (thickness) of the flange of the present invention is different than in US '482, US '482 does not disclose or suggest the present invention.

US '482 also discloses yield strength of the connector.

However, US '482 merely discloses a relationship of yield strength of the steel material between the connector and columns or beams, and does not disclose or suggest to limit within a specific range of the yield strength of steel material used for the split tee.

As described on page 14, line 37 to page 15, line 34 of the specification, the limitation of upper limit and lower limit of the yield stress of the steel material used for the flange of the split tee reduces the cost of the structure because the cross-sectional area of the column can be reduced.

In the structural design, when yield strength of at least the flange of the split tee broadly varies, the dimension of the flange of the split tee and/or the structure design has to be changed in order to obtain energy absorption effect explained above, and it causes cost to increase.

Therefore, by limiting the variation of yield strength of the split tee within the specific range, cost increases due to the dimensional design change and structural design change can be reduced.

US '482 does not disclose or suggest that upper limit and lower limit of the yield stress of the steel material used at least for the flange of the split tee is to be limited to the specific range.

U.S. Patent No. 4,905,436 ("US '436") relates to a column and beam joint structure and discloses a structure where the column 1 and beam 2 are joined by connector 3 using bolts.

As shown in Fig. 9 of US '436 reinforcing plates 9 are inserted between the flange of connector and the flange of the column.

As shown in Figs. 1 and 2 of US '436, these reinforcing plates are to prevent the flange of the column from deforming by the tensile or compressive stress acting on the flange of the column when bending is exerted on the joint portion.

Therefore, the reinforcing plates of US '436 are welded to the surface of the flange of the column.

Further, US '436 does not provide a space between the flange of the column and the flange of the connector, which serves as a deforming space of the flange of the split tee in the present invention, and which is located at least at the region corresponding to the extended direction of the web of the split tee.

Therefore, these reinforcing plates of US '436 cannot have a function to plasticize the flange of the split tee prior to other parts thereof, and the column and the beam.

The reinforcing plates of US '436 are different from the space keeping members of the present invention and do not disclose or suggest the space keeping members of the present invention.


It is therefore submitted that claim 8-9 and 14-20 are patentable over U.S. Patent No. 6,059,482 to Beauvoir in view of U.S. Patent No. 4,905,436 to Matsuo et al.

**CONCLUSION**

It is submitted that in view of the present amendment, the forgoing remarks, and the Terminal Disclaimer, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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